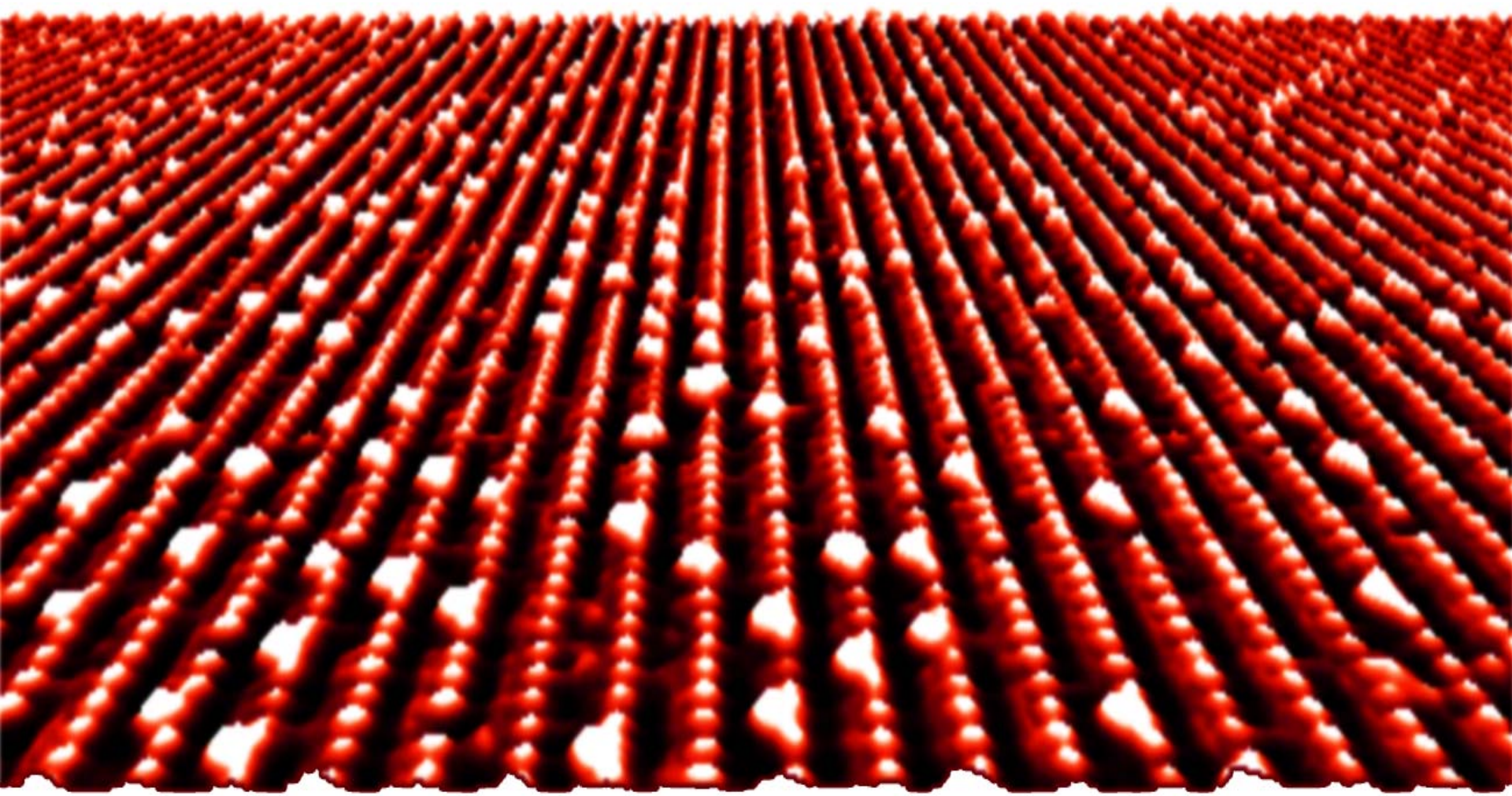


Atomic chains: The Ultimate Nanowires

F. J. Himpsel, UW Madison, DMR-0240937

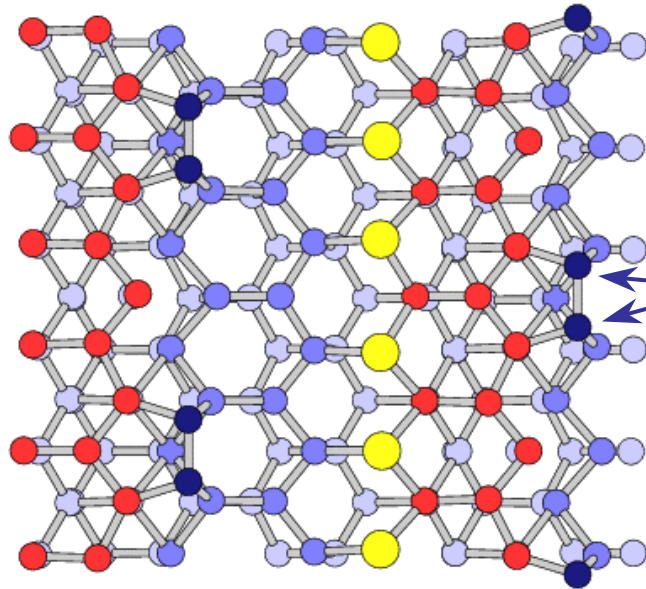


Graphitic
ribbon

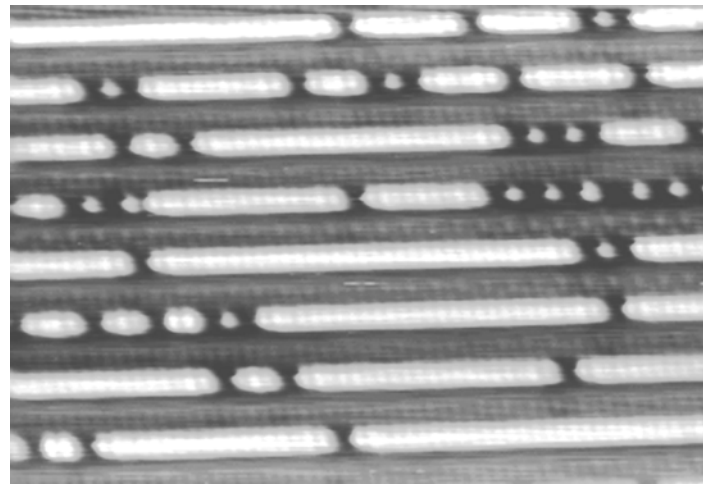
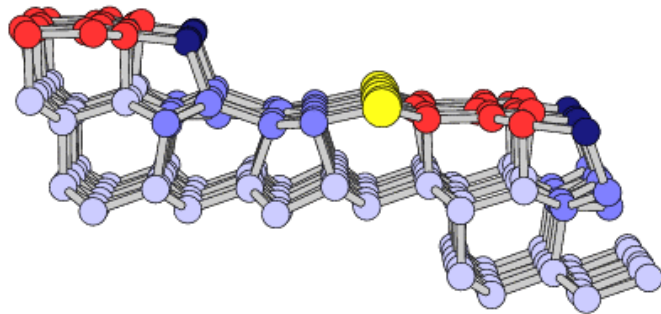
Au
chain

Extra Si
edge atoms

Gold Chains on Silicon



- 2 extra Si atoms provide $8/3$ electrons per Au atom.
- Explains fractional band filling as 1D analog of the doping of CuO - planes in HiTc superconductors.
- Explains $\times 3$ instability in STM.
- Is there a 1D analog of the fractional quantum Hall effect?



Nascent 1D
instabilities:

← $\times 3$
← $\times 2$

From first principles calculations
for >40 models. Collaboration with
S.C. Erwin, NRL, PRB, in press.
Crain et al., PRL **90**, 176805 (2003)

Educating Students and the Public on Nanoscience and Technology

- **FJH** was lead-off speaker at Nano-Expo, Madison, May 30-31, 2003, and appeared on a video about nanotechnology produced for the general public on this occasion.
- He is currently teaching a popular graduate course on nanoscience and technology the second time around (38 students, the enrollment limit needed to be raised twice).
- Co-organized a joint NSF/EC Workshop on Nanotechnology, Grenoble, June 12-14, 2002. DMR-0211829; Proceedings at:
ftp://ftp.cordis.lu/pub/nanotechnology/docs/nano_grenoble_proceedings_en_1102.pdf
- **Jason Crain** and **Armen Kirakosian** graduated in 2003, now postdocs at NIST on a NRC fellowship and at UC-Berkeley. Jason Crain received the 2002 Aladdin Lamp Award for his work on electrons in atomic chains.
- **Jessica McChesney** (grad student) won two best poster awards in 2003, and presented her results to Representative Vernon Ehlers. Her image of a gold chain structure serving as atomic scale memory was selected for the American Vacuum Society's nanotechnology poster: <http://divisions.avs.org/nstd/PosterNSTD.pdf>